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ABSTRACT

Acknowledging a growing national awareness of the need for direct instruction in higher order thinking skills within public education, this paper describes an instructional model for reinforcing thinking skills in the classroom, kindergarten through grade 12. Following an introduction justifying the model's reliance on the processing of information in linguistic form, the paper discusses the model's three general areas of thinking skills: basic concept development, recognition of patterns among ideas, and use of paradigms for specific educational tasks. It then discusses four specific areas in which a classroom using this model would differ from a more traditional classroom. The paper's conclusion reiterates that the model is a framework within which teachers can interact with students about information. (HTH)

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A LANGUAGE/INTERACTION BASED MODEL FOR TEACHING THINKING SKILLS

by

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INTRODUCTION

There is a growing national awareness of the need for direct instruction in higher order thinking skills within public education. The Education Commission of the States, in a report entitled The Information Society: Are High School Graduates Ready? (1982), states that "survey results indicate that today's minimum skills are demonstrated successfully by a majority of students. Higher order skills, however, are achieved only by a minority of 17-year-olds. If this trend continues, as many as two million students may graduate in 1990 without the skills necessary for employment in tomorrow's marketplace." (p. 12) Similarly the recent presidentially-commissioned report, A Nation at Risk (1983), in its list of implementing recommendations for "Recommendation A: Content", identifies specific higher level thinking skills that should be more "rigorously addressed" (e.g., evaluation, estimating, interpretation).

The purpose of this paper is to describe an instructional model for reinforcing thinking skills in the classroom (K-12). Here is presented only a brief overview of the model. For a more detailed description see Marzano (1984). I should note here that the model relies heavily on the processing of information in linguistic form. At first this might seem limiting, yet if one considers the fact that the primary means of communicating information to students in a classroom setting is via language (e.g., Students are either listening to information or reading about it.) and language is the primary means of students communicating about information (e.g., Students are either

writing or speaking about information.) a linguistic framework seems quite logical. Indeed, this is one of Boyer's (1983) basic recommendations - use language as a focal point for instruction. In this model, the intent is not to improve students' use of language, but to help students see how information is "organized" and "used" in the mind - language is the tool for studying that organization and use.

THE MODEL

The model contains three general areas of thinking skills:

Area #1: Basic Concept Development.

One of the first lines of processing of information presented in linguistic form is the recognition of words as units of meaning. It is certainly true that a reader or listener does not process or even attempt to process all words when reading or listening. This has been demonstrated by many (Goodman, 1967; Smith, 1978). However, it is also true that if a critical mass of words is not recognized immediately or automatically when reading or listening, processing soon breaks down (LaBerge and Samuels, 1974).

At the heart of the process of recognizing a word is concept development. In effect an individual's vocabulary can be mapped onto his/her store of concepts in semantic memory. That is, a word is simply a label for a concept stored in long term memory. It is no wonder, then, that vocabulary knowledge is a strong predictor of almost all school related tasks (Anderson and Freebody, 1981). Given the strong relationship between vocabulary knowledge and school related tasks we might conclude that a systematic vocabulary development program should be the cornerstone of any program which purports to improve cognitive skills. In effect this was Becker's (1977)

recommendation after his analysis of field research on instructional programs for the educationally disadvantaged. He stated that a major thrust in education should be systematic instruction in the basic concepts as defined by Dupuy (1974).

One of the most efficient ways of teaching and reinforcing basic vocabulary appears to be the presentation of new vocabulary words in the context of words that are strongly related and the student already knows (Klausemeier & Sipple, 1980). For the model proposed here 7,300 concepts found in elementary school textbooks (K-6) were organized into 61 instructional clusters (Marzano, 1983). Those 61 clusters form the framework for a systematic program of vocabulary/concept development. To briefly illustrate, a cluster is a group of words/concepts that are related but not necessarily synonymous. For example, one instructional cluster is "Occupations." It contains 364 concepts such as employer, boss, author, poet. These 364 are subdivided into 30 smaller clusters with closer semantic ties (e.g., "Occupations Related to Sports," "Occupations Related to Transportation."). Using these categories a teacher can introduce new words/concepts in groups rather than individually. The instructional procedure is:

1) to have students define, in their own terms, how the new concepts are similar to and different from each other and to concepts the students already know.
2) to have students form strong mental images of events associated with the concepts (e.g., experiences they have had that might

exemplify the concept). This visual association also includes kinesthetic associations.

3) to have students visualize how the word looks in print, and hear how the word sounds in spoken English.

4) to have students review the new concepts systematically.

Although the 61 clusters account only for elementary school concepts/vocabulary words the same instructional process can be used with secondary school concepts.

Area #2: Recognition of Patterns Among Ideas.

One of the more useful findings from research in cognitive psychology is that linguistic information is organized in very distinct structures, and the extent to which an individual can recognize those structure determines, at least partially, the extent to which that information is efficiently processed. For this model three levels of organization between/among idea units (propositions) within linguistic information have been identified: 1) simple relationships between ideas; 2) patterns of relationships among ideas; and 3) super-structures of organization. Simple relationships between ideas are those elemental relationships such as time, cause, similarity and dissimilarity. Many researchers have attempted to identify various categories of these relationships (Meyer, 1975; Turner and Green, 1977; Halliday and Hasan, 1976). Research indicates that overt knowledge of these relationships and their signals improves comprehension (Katz and Brent, 1968). Indeed if these relationships between ideas are missed processing soon breaks down (Kintsch, 1979).

Patterns are the organizational schemes used to chunk sets of ideas. It has been shown that the extent to which these higher level

patterns or organizational structures are made salient, the easier information is processed (Meyer, 1975; Kintsch and Van Dijk, 1978). Unfortunately many textbooks and sections of textbooks are not written in obvious patterns. In such cases, the burden is placed on the reader to superimpose a logical pattern on the information (Pearson and Camperell, 1981).

Super-structures are perhaps the largest unit of organization for connected discourse. De Beaugrande (1980) has identified eight types of super-structures (e.g., description, narrative, argumentative); Van Dijk (1980) has identified four.

There is a rapidly growing body of research which indicates that relationships, patterns and super-structures can be explicitly taught to students and used by them to facilitate the processing and retrieval of linguistic information (Taylor & Samuels, 1983; Alexander et al., 1983; Leslie & Jett-Simpson, 1983; Greenewald & Pederson, 1983). Consequently a key component of this instructional model for higher order thinking skills is overt instruction in and reinforcement of relationships, patterns and super-structures within information students read and hear. That is, once relationships, patterns and super-structures are taught to students, that information is used as a common language between teacher and student to discuss and interact about how information is organized in a text or in a lesson.

Area #3: Utilization of Paradigms for Specific Educational Tasks.

Doyle (1983) has reported that success in school is largely a process of identifying and mastering algorythms or paradigms for specific academic tasks. Unfortunately the paradigms for accomplishing those tasks are seldom identified and taught even less frequently. In

the model proposed here seven general categories of academic tasks have been identified, each with its own body of supportive research and theory.

1) Organizing information for efficient storage in long term memory. (Kintsch, 1979; van Dijk, 1980; Bean et al., 1983)
2) Evaluating information. (Toulmin et al., 1979; Glaser, 1981; Powers, 1973)
3) Extrapolating information to new situations. (Alston, 1964; Ortony, 1980; Arter, 1976)
4) Problem solving. (Wickelgreen, 1974; Hughes, 1976; Groen & Resnick, 1977)
5) Use of the basic input/out processes. (DiStefano et al., 1984; Tulving, 1972; Flower & Hayes, 1981)
6) Use of content specific processes. (Culler, 1980; Doyle, 1983)
7) Knowledge of self as learner. (Harter, 1983; Shavelson et al., 1976)

Here the recommendation is that explicit algorythms or paradigms be taught to students for each of these areas, not with the intent of prescribing how students should accomplish one of these tasks but with the intent of developing a common understanding or operational definition of the processes involved so that teacher and students may interact about the processes.

To illustrate, we will consider one of three types of evaluation -- evaluation of logic. Based on the work of Toulmin et al. (1979) a fairly straightforward algorithm can be presented to students for

evaluating the logic of a statement.

1) Identify claims in material read or heard.

2) Identify the proof for the claim. If no proof exists, then the claim is unsubstantiated. If unsubstantiated, does the claim fall within the domain of general knowledge?

3) If proof exists, identify any errors in logic.

e.g., a) Assuming an incorrect cause or condition for an event;

b) Incorrectly attributing characteristics to a concept;

c) Assuming that concepts are similar or dissimilar on a number of dimensions when they are similar or dissimilar on only a few;

d) Incorrectly assuming a statement falls within a generalization.

4) If no error is found, then the claim is substantiated and logical.

Once this algorithm is taught to students it becomes a framework in which teacher and student can discuss the act of evaluation and compare one student's conclusions with another student's.

INSTRUCTIONAL IMPLICATIONS

How would a classroom which utilizes the model be different from what might be called a more traditional classroom? Differences would be evident in four major areas.

1) First the concepts which are considered basic to each context area would be identified and stratified by some set of rules which account for their hierarchical structure and/or their developmental sequence. These concepts would be systematically taught and reinforced throughout the curriculum (K-12). This fits nicely into a Piagetian model of learning in that Piaget (1970) asserts that individuals must

organize the information they perceive before they can assimilate it. Such an organization of the concepts presented in content areas would drastically reduce the organizational load on students and perhaps decrease the time needed for students to capture the fundamentals within various content areas. This possibility is supported by the research review of Hyman & Cohen (1979) who recommend that the curriculum should be cut down into small digestible bites - the smaller the bite - the more immediate the closure. For some teachers in some content areas this would require a massive analysis and perhaps reorganization of their content. In essence, here I am implying that one reason for the failure of some students to understand some content is that the content has not been organized for them in a "digestible" way. Concomitant with this is the assertion that the very act of organizing and presenting the basic concepts would take so much of the organizational load off students that their understanding would naturally increase.

2) Other than the hierarchical organization of content in terms of basic concepts, a classroom utilizing the model would focus on teaching processes and patterns. That is, the instructional emphasis would be on explaining, modeling and reinforcing information processing techniques (Area #3) and patterns of information organization (Area #2) rather than on content. Again, for some this would mean a drastic shift away from a stance which views the teacher as a deliverer of facts to one which views the teacher as a facilitator of thinking and introspection.

3) As a consequence of the use of the model, there would be a high degree of interaction between teacher and students. Specifically,

there would be more direct teaching of heterogeneous groups. Such a notion is quite consistent with much of the effective schools research. Good, Grouws and Ebmeier (1983) found that effective teachers used direct teaching with their classes as a whole a larger percent of time and spent more time explaining and interacting with students than did less effective teachers. Stallings (1982) found that if students give an incorrect response it is important that the teacher interact with the student about the response rather than move on to another student for the correct response. This interaction helps clarify for the student why his/her response is inaccurate and provides an opportunity for incidental learning for the rest of the students who are observing the interaction.

Relative to teacher/student interaction the thinking skills categories provide a framework within which teacher and students can interact for an extended period of time at deeper levels. More specifically the patterns of organization and processes taught to students provide a common vocabulary between teacher and students which can be used to expand and extend student/teacher interaction. For example, teachers and students can discuss the relative merits of one student's evaluation because all share common patterns of evaluation; teacher and students can discuss different ways of interpreting information because they share a common knowledge of patterns of information organization.

4) Finally, the system of student evaluation used in a school which implemented the thinking skills model would be greatly expanded and more specifically delineated. Current standardized multiple choice tests, although similar in surface appearance, require a wide range of

abilities to answer different items. Items from a given test are scored together yet no attempt is made to isolate specific skills measured by each item. For example, Wardrop (1970) reviewed standardized reading achievement tests and noted that "comprehension subtests differ markedly in content passages presented, lengths of passages, type of behavior required for responding correctly, number of test items per reading passage and readability of the content presented." Wardrop asserts that the operational definition of reading comprehension seems to have become a function of the test author's idiosyncratic feelings about the construct, and in only a few isolated cases have efforts been made to underpin item development with construct theory.

In light of this we cannot assume that standardized tests would discriminate well among the various thinking skill categories. That is, it would be difficult to predict which item or item categories would be affected by a gain or mastery of specific thinking skill categories. In addition, many of the thinking skill categories deal with the reinforcement of processes (e.g., Area #3). A student's knowledge and use of these processes probably cannot be measured via a multiple choice test. All of this implies that alternate forms of evaluation must be created which allow students to provide more information than the selection of an item from among alternatives. A ready-made vehicle for such evaluation is essay-type questions which require students to describe how they would accomplish a specific task (e.g., how they would solve a problem or evaluate a piece of information). These answers would then be scored only for their adherence to the particular algorithm presented to the student or for

the student's justificatic. of a self-generated algorithm. Such a scoring system could be easily adapted to primary trait scoring procedures (Lloyd-Jones, 1977). In this same vein, teachers could use more informal means of diagnosing a student's use of processes by observing students performing tasks and/or asking students to describe the process they are using to accomplish a task.

CONCLUSION

At a basic level this thinking skills model is simply a framework within which teachers can interact with students about information. The concepts, patterns and processes taught students provide a common language between teacher and students - a vocabulary that can be used to explore new arenas of thought. For this expansion of the domain of education a price must be paid-that price is our attachment to "coverage" of a certain number of workbooks, stories, problems, etc., within a given period of time. As de Bono (1983) states, "we may have to reduce the time we spend teaching information in order to focus instead on the direct teaching of thinking skills", (p. 704). Given the future trend of increased need for information processing ability (Naisbitt, 1982), we have little choice in the matter if we are to meet our obligation of fair and relevant education for all.

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